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A STUDY TO COMPARE GRADE VII ACHIEVEMENT IN THE BRITISH
COLUMBIA PEACE RIVER AREA WITH SELECTED FACTORS

by

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A THESIS

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled "A Study to Compare Grade VII Achievement in the British Columbia Peace River Area with Selected Factors" submitted by Arthur R. Fletcher in partial fulfilment of the requirement for the degree of Master of Education.

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THE ABSTRACT OF A STUDY TO COMPARE GRADE VII ACHIEVEMENT
IN THE BRITISH COLUMBIA PEACE RIVER AREA
WITH SELECTED FACTORS

This study investigated the degree of relationship between pupil achievement and certain selected variables. Four hundred seventy-six pupils in forty-nine classes of two school districts were used for the investigation.

The basic statistical method used was the computation of correlation coefficients. However, to make the correlations involving teacher and environmental factors more meaningful, the pupil achievement was modified by means of a multiple regression equation to control the effect of intelligence and socio-economic status, both chosen because of their significant correlation with pupil achievement.

Three pupil variables were found to be significantly correlated with achievement. The intelligence quotient of the pupil and the socio-economic status of the father both showed significant correlation with achievement even after the effect of each on the other and of pupil age was controlled. Whether or not the pupil had failed a grade was also found to be significantly related to pupil achievement. However, the design of the study did not permit the investigation of this variable using a control on

intelligence and socio-economic status.

Only one of the teacher variables and none of the environmental variables was significantly correlated with modified pupil achievement. The significant correlation was between modified achievement and whether or not the teacher was new to the school.

No significant correlation was found between pupil achievement and the pupil factors of age, sex, and mobility. Similarly, none was found between modified achievement and the teacher variables years of post-secondary education, years of teaching experience, age, and sex. The size of the school, the size of the class, and the number of grades in a classroom all failed to be significantly related to modified pupil achievement.

The results indicated that the pupil factors, rather than the teacher and environmental factors, have the strongest relationship with pupil achievement. This conclusion is in agreement with other recent findings and indicates that in the search for variables that are related to pupil achievement, a major proportion of effort should concentrate upon pupil differences rather than those of the teacher or the environment.

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CHAPTER I

THE PROBLEM AND DESIGN

I. INTRODUCTION

The problem of isolating the variables that are related to academic achievement has received considerable attention from educational theorists and researchers. A study of these and other writings uncovers a lack of agreement regarding the relationship of various factors and the academic achievement of pupils.

A number of studies in this general area have been carried out in the Province of Alberta where tests in Grades IX and XII are given to all students in the Province. There have been no comparable studies in British Columbia. The system of accrediting certain schools in this Province has meant that in no grade in the secondary school do all students in the Province write the same examination. In April, 1962, for the first time, all students in Grade VII in British Columbia wrote the same examination. This procedure has been repeated in subsequent years.

A lack of data about the teacher force and other variables prevented a study which would sample the whole province. This study within the Peace River Area has certain limitations but nevertheless has implications for education in that area and gives general indications of the

provincial picture.

The Peace River Area of British Columbia was regarded, for the purposes of this study, as including the area enclosed by the boundaries of School District No. 59 (Peace River South) and School District No. 60 (Peace River North). The area includes nearly all of that portion of British Columbia that lies east of the Rocky Mountains and south of the fifty-eighth parallel. Nearly twenty-five per cent of the Grade VII students in the area attended small rural schools of four or fewer classrooms. Moreover, many of the students attending larger centralized schools lived in the rural areas and were bused to one of the three centres of population: Dawson Creek, Fort St. John, and Chetwynd. Although the majority of students living in the rural areas represented the agricultural industry, a percentage that has been increasing over the past few years came from families engaged in gas and oil exploration and refinement. Residents of the centres of population are employed in a variety of job categories with an emphasis on occupations related to the petroleum industry.

II. THE PROBLEM

Statement of the problem. The purpose of this study was to find out whether or not certain selected variables were related to pupil achievement. The variables investi-

gated in this study were:

A. Pupil Factors

1. Age
2. Sex
3. Mobility during school career
4. Socio-economic status of father
5. Past non-promotion
6. Intelligence Quotient

B. Teacher Factors

1. Years of post-secondary education
2. Years of experience in teaching
3. Age
4. Sex
5. Years teaching in present school

C. Environmental Factors

1. Size of school
2. Size of class
3. Number of grades per classroom

Importance of the problem. Nearly everyone will agree that one of the prime purposes of education is intellectual growth. The commonly used measure of intellectual growth is the achievement test. It is logical, then, that if education is to be improved, the variables which are related to, and which may affect, achievement should be isolated.

Assumptions. Two basic assumptions made were that the Lorge-Thorndike Intelligence Test¹ is a valid measure of intelligence and that the battery of achievement tests constructed and administered by the British Columbia Department of Education is a valid measure of pupil achievement. Buros rates the Lorge-Thorndike Intelligence Test as one of the best of the group tests available.² The battery of achievement tests included two tests constructed by the Department and one standardized achievement test. The two tests constructed by the Department tested material covered in Grade VII Science and Social Studies. The standardized achievement test was the Metropolitan Achievement Test³ containing sub-tests in vocabulary, reading, spelling, language, language study skills, arithmetic concepts, arithmetic problems, and social studies skills.

The assumption was made that the tests were administered to all students under similar conditions. Explicit instructions and a rigid time-table to be followed

¹The Lorge-Thorndike Intelligence Tests, Level 4, Verbal Battery, by Irving Lorge and Robert L. Thorndike. Published by Houghton Mifflin Company, Boston.

²Oscar Buros (ed.), The Fifth Mental Measurements Yearbook (Highland Park, New Jersey: The Gryphon Press, 1959), pp. 478-84.

³Metropolitan Achievement Tests, Advanced Battery Partial. Published by World Book Company, New York.

by the teachers accompanied the battery of tests.

Since no other method was found that would produce a more valid achievement score, equal weighting of the various sub-tests to arrive at an achievement score was assumed to be a valid method of weighting. The assumption was made that the initial level of achievement of the students was randomly spread throughout the schools and therefore would not have affected greatly the results obtained. It was also assumed that the curriculum taught at all the schools was the same and that all students had been equally motivated to do their best on the tests.

Finally, all the information gathered from the various sources was assumed to be accurate.

Delimitations. The study was delimited to the achievement, as measured by the combination of tests, of Grade VII students. Other purposes of education, such as social and personal adjustment, were not evaluated. Moreover, only those Grade VII students who attended school in the Peace River Area of British Columbia in April, 1963, were studied.

Pupils who missed the intelligence test or more than five of the ten achievement sub-tests were not included in the study.

Limitations. Data for three of the variables--

mobility, socio-economic status of the father, and past non-promotion--were not available for almost twenty per cent of the pupils. Reasons for the unavailability of the data varied but the most common was that the pupils had left the district at the end of the school year, before the data was collected. These pupils were not included in the study and their omission may have affected the results.

The students studied did not necessarily form a sample of the students of British Columbia, or even of the Grade VII students of the Province; thus generalization to the provincial level is hazardous. The teachers studied were not necessarily a sample of the teacher force of the Province and thus generalization is again hazardous.

Randomization was the only method used to control the effect of the initial achievement level and hence past learning may have affected the results of this study.

Academic achievement as measured by an objective group achievement test is only one of the several objectives of classroom instruction. The study is, therefore, limited in that it did not investigate other objectives of any educational system.

The variables, intelligence and socio-economic status, were treated as interval variables throughout this study; whereas, in fact, they are ordinal variables. Ferguson recognizes this treatment as a frequent procedure often

necessitated by the design of the study.⁴ Nevertheless, information was imposed upon the variables and this assumption of information not contained in the original data placed a limitation on the results of the study.

III. DEFINITIONS OF TERMS

Achievement. Achievement was defined as the mean of the stanine transformations of the scores received on the ten parts of the achievement battery administered to the students.

Class size. The size of the class was taken as the number of Grade VII pupils in the class when the first subtest of the examination was administered. The variable, class size, was considered only for those classes containing exclusively Grade VII pupils.

Intelligence Quotient. The value used for the intelligence quotient in this study was the stanine transformation of the intelligence quotient determined by the Lorge-Thorndike Intelligence Test.

Mobility. The mobility of the pupil during his school career was the total number of times he transferred

⁴George A. Ferguson, Statistical Analysis in Psychology and Education (New York: McGraw-Hill Book Company, Inc., 1959), pp. 12-13.

from one school to another from the time he entered Grade I to the time of the administration of the examinations. This figure did not include transfers from one town school to another which may have been caused by changes in attendance boundaries. A dichotomous variable was indicated and the terms "moved" and "static" were used to represent the elements of the dichotomy. "Moved" indicated the pupil moved one or more times during his school career and "static" indicated he did not move.

Modified achievement mean. The modified achievement mean of a class was the term given to the difference obtained by subtracting the actual achievement mean from the predicted achievement mean. The actual achievement mean was the calculated mean of the achievement scores of the pupils in the class. The predicted achievement mean was calculated with a regression formula using the pupil variables found to be significant.

Number of grades per classroom. The number of grades represented in the classroom was the total number of grades registered in the classroom which contained the pupils who wrote the examination.

Past non-promotion. Past non-promotion refers to whether or not the student had been required to repeat one or more grades prior to April, 1963. Here again a dichotomous variable was required. Students who had not been

required to repeat were categorized as "promoted" and those who had repeated one or more times as "non-promoted".

Pupil age. The ages of the pupils were given in months and were defined as the age of the pupil to the closest month on January 31, 1963.

School size. The size of the school was taken as the number of pupils registered in the school for April, 1963.

Socio-economic status. The socio-economic status of the father was designated by a social class number as determined from the Occupation Class Scale devised by Blishen.⁵ Blishen has listed occupations in rank order according to a combined score of average income and average number of years of schooling. The resulting list, consisting of 343 occupations, is divided into seven classes numbered one to seven, with Class 1 containing the occupations ranking highest in the scale; that is, with high income and high numbers of years of schooling.

Teacher age. The age of the teacher was taken as his reported age on his 1963 birthday.

Teacher education. This was the number of years of

⁵Bernard R. Blishen, et al., Canadian Society (Toronto: The Macmillan Company of Canada Limited, 1961), pp. 477-84.

academic and professional education taken at a university or teacher education institution, as recognized by the British Columbia Department of Education for salary grant purposes. The number includes the senior matriculation year.

Teacher experience. The number of years of teacher experience was taken as the number of full years of experience in teaching as recognized by the Department of Education for salary grant purposes.

Years teaching in present school. This was taken to the closest year, ten months constituting one year of teaching.

IV. COLLECTION OF DATA

The data on pupils were gathered from two sources: Department of Education records and the pupils themselves. The Department records used were print-out sheets of punched cards containing, for each pupil, the scores of the ten areas of the achievement tests, the stanine transformations of these scores, the mean of the ten stanine transformations, the sex of the pupil, his chronological age, his mental age, his intelligence quotient in both raw and stanine form, his school district, his school and his division. A questionnaire⁶ was used to elicit the information from the pupils themselves needed to determine their

⁶Appendix B, page 88.

mobility, their past non-promotion, and the socio-economic status of their fathers. The study included 476 pupils in the two school districts.

The data on the forty-nine teachers used in the study were obtained from the District Superintendents of Schools of the two districts used in the study. The Superintendents consulted records which had been verified by the Department of Education. Data regarding the size of the schools, the class sizes, and the number of grades per classroom were also obtained from the District Superintendents.

V. HYPOTHESES

To determine which of the selected factors were related to achievement, as defined within this study, the following null hypotheses were tested.

At the .05 level of significance, there is no significance to the correlations between the achievement of Grade VII pupils and:

1. the age of the pupils,
2. the sex of the pupils,
3. pupil mobility,
4. the socio-economic status of the fathers,
5. past non-promotion, and
6. the pupils' intelligence quotients.

At the .05 level of significance, there is no

significance to the correlations between the modified achievement of Grade VII pupils and:

1. the years of post-secondary education of the teachers,
2. the years of teaching experience of the teachers,
3. the age of the teachers,
4. the sex of the teachers,
5. the number of years the teachers have been in their present schools,
6. the size of the schools,
7. the size of the classes,
8. the number of grades per classroom, and
9. the deviations of the pupils' ages from the mean age.

VI. METHOD OF ANALYSIS

The problem in this study was to measure the degrees of relationship between pairs of variables. This degree of relationship is called correlation.⁷ An examination of the variables showed that the majority of them were, or could be assumed to be, quantitative; that is, they permitted the

⁷George A. Ferguson, Statistical Analysis in Psychology and Education (New York: McGraw-Hill Book Company, Inc., 1959), p. 86.

making of statements of equality of intervals, of sameness or difference, and of greater than or less than.⁸ Where the correlation of two quantitative variables was desired the Pearson product-moment correlation coefficient was

calculated. Its use for this combination of variables is suggested by both Ferguson⁹ and Siegel¹⁰. The formula used

$$\text{was } r = \frac{N \sum XY - \sum X \sum Y}{\sqrt{[N \sum X^2 - (\sum X)^2][N \sum Y^2 - (\sum Y)^2]}}$$

where N is the number of pairs of observations and X and Y are the two variables.¹¹ Three of the teacher variables: years of post-secondary education, years of experience in teaching, and years teaching in present school, were defined as ordinal variables; that is, they permitted only rank ordering of the members, with statements of sameness or difference and of greater than or less than. Siegel's recommendation of the Spearman r_s correlation coefficient when working with ordinal variables was followed in this study. The formula for calculating Spearman's correlation coefficient is

$$r_s = \frac{\sum x^2 + \sum y^2 - \sum d^2}{2 \sqrt{\sum x^2 \sum y^2}},$$

$$\text{where } \sum x^2 = \frac{N^3 - N}{12} - \sum T_x, \quad \sum y^2 = \frac{N^3 - N}{12} - \sum T_y,$$

⁸Ibid., pp. 11-12.

⁹Ibid., p. 87.

¹⁰Sidney Siegel, Nonparametric Statistics for the Behavioral Science (New York: McGraw-Hill Book Company, Inc., 1956), p. 30.

¹¹Ferguson, op. cit., p. 92.

$T = \frac{t^3 - t}{12}$, t is the number of tied observations at a given rank, d is the difference between a pair of ranks, and N equals the number of observations.¹² Finally, three of the pupil variables; sex, mobility during school career, and past non-promotion, were dichotomous and hence the point-biserial correlation coefficient was used to measure correlation involving them. The formula used was

$r_{pbi} = \frac{\bar{X}_p - \bar{X}_q}{s_t} \sqrt{pq}$ where s_t is the standard deviation of all scores on the continuous variable, p and q are the proportions of individuals in the two categories of the dichotomous variable, and \bar{X}_p and \bar{X}_q are the mean scores on the continuous variable of the individuals within the two categories.¹³

The basic statistical method of this study was the computation of correlation coefficients. However, to make the correlations involving teacher and environmental factors more meaningful, the raw pupil achievement scores were modified to control the effect of the intelligence quotients of the pupils and of the socio-economic status of the fathers. These two pupil variables were chosen because of their significant correlation with pupil achievement.¹⁴ The

¹²Siegel, op. cit., pp. 202-13.

¹³Ferguson, op. cit., pp. 199-202.

¹⁴Infra, pp. 45-51.

method used to control the effect of intelligence and socio-economic status was to predict pupil achievement on the basis of these two variables and then determine the difference between this predicted achievement score and the actual achievement score. This difference was referred to as the modified achievement score.¹⁵ The prediction of pupil achievement was done by using the multiple regression equation given by Ferguson

$$X'_1 = \beta_2 \frac{s_1}{s_2} X_2 + \beta_3 \frac{s_1}{s_3} X_3 + (\bar{X}_1 - \beta_2 \frac{s_1}{s_2} \bar{X}_2 - \beta_3 \frac{s_1}{s_3} \bar{X}_3),$$

where X'_1 is the predicted achievement score; X_2 and X_3 are the predictor variables; β_2 and β_3 are the beta weights calculated from the correlation coefficients; s_1 , s_2 , and s_3 are the standard deviations for the three variables; and \bar{X}_1 , \bar{X}_2 , and \bar{X}_3 are the mean scores of the three variables.¹⁶ In this study, the formula reduced¹⁷ to $X'_1 = 6.1645X_2 - .0333X_3 + 13.43$.

This multiple regression equation used to predict pupil achievement was applied to the class means of the intelligence quotients and the socio-economic status to

¹⁵This procedure was determined in consultation with Dr. J. H. M. Andrews in July, 1964.

¹⁶Ferguson, op. cit., pp. 295-96.

¹⁷The values for substitution into the formula to give the reduced equation are found in Table II, page 48, and in Appendix A, page 82.

arrive at a predicted achievement score. This score was the mean of the individual predicted achievement scores that would have been obtained had the regression equation been applied individually to each pupil's score.¹⁸

Finally, each correlation coefficient found was tested for significance using the distribution of t , where the value of t is found by the formula $t = r\sqrt{\frac{N-2}{1-r^2}}$, where N is the number of cases and r is the correlation coefficient.¹⁹

¹⁸The validity of this statement can be proven mathematically. The predicted achievement score of an individual pupil, y , can be represented by $y = ax_2 + bx_3 + c$, where x_2 and x_3 are the two variables and a , b , and c are constants. The mean of the individual predicted achievement scores would then be $\frac{\sum (ax_2 + bx_3 + c)}{N}$.

However this equals $\frac{a\sum x_2 + b\sum x_3 + Nc}{N}$ which reduces

to $a\bar{x}_2 + b\bar{x}_3 + c$. Hence $\bar{y} = a\bar{x}_2 + b\bar{x}_3 + c$; that is, the mean of the predicted achievement scores is found by applying the regression equation to the means of the variables.

¹⁹Ferguson, op. cit., pp. 152-53.

CHAPTER II

RELATED LITERATURE

I. ALBERTA STUDIES

The tabulation of information on the Alberta teacher force by MacArthur and Lindstedt¹ in 1958 gave rise to a series of studies, started by Lindstedt² in 1960, on the relationships between various factors and the achievement of Alberta school pupils in Grade IX and XII. Similar studies have been completed by Wasylyk³, Eddy⁴, and Klufas⁵ and more

¹R. S. MacArthur and S. A. Lindstedt, The Alberta Teacher Force in 1957-58 (University of Alberta Monographs in Education Number 3. Edmonton, Alberta: The Alberta Advisory Committee of Educational Research, University of Alberta, 1958).

²S. A. Lindstedt, "An Analysis of the Relationship Between Certain Qualifications of Grade IX Mathematics Teachers in Alberta Schools and the Results of Their Students in the Final Examinations for the Year 1957-58" (unpublished Master's thesis, The University of Alberta, Edmonton, 1960).

³E. Wasylyk, "The Relation Between Four Selected Teacher Characteristics and Student Achievement in Grade Twelve Mathematics" (unpublished Master's thesis, The University of Alberta, Edmonton, 1961).

⁴Wesley P. Eddy, "A Study of Certain Characteristics of Teachers in Relation to Grade IX Social Studies Achievement" (unpublished Master's thesis, The University of Alberta, Edmonton, 1962).

⁵Harry Klufas, "An Analysis of the Relationship Between Four Selected Characteristics of Teachers and the Results of Their Students in the Final Examinations in Physics 30" (unpublished Master's thesis, The University of Alberta, Edmonton, 1964).

are underway at the present time.

When Lindstedt analyzed the relationship between certain measurable characteristics of Grade IX mathematics teachers in Alberta schools with the result of their students on the final mathematics examination, he found significant differences among teachers of differing years of experience, years of professional training, and subject preference. However, he also found that the number of university courses taken in the field of mathematics did not produce a significant difference in results. The statistical methods used by Lindstedt to analyze the data were the chi-square test and analysis of variance.⁶

Using the same method of analysis but in Grade IX social studies, Eddy found a significant positive relation between achievement and the years of teacher education, the university-level courses taken in the social studies area, the years of teaching experience, the size of the school, and the subject field preference of the teacher. He found no significant relation between achievement and the age of the teacher, the median size class, the hours of work devoted to the teaching job, and the sex of the teacher.⁷

Wasylyk, investigating the relation between character-

⁶Lindstedt, op. cit., pp. 47-55.

⁷Eddy, op. cit., pp. 66-68.

istics of Grade XII mathematics teachers and the achievement of their pupils on final examinations, found that teaching experience and training, both separately and combined, were positively related to achievement. He also found that achievement increased as the number of mathematics courses taken by the teacher increased.⁸

Klufas used the results of Physics 30 Departmental examinations in his study. He found insignificant correlation between achievement and the number of years of professional education. He found a significant relationship, however, between achievement and the three variables: years of teaching experience, teacher's preference for teaching science, and number of university-level courses taken in science. He also determined that 15 to 19 years of teaching experience was the most effective range.⁹

Another Alberta study that relates to the present study is an investigation by Tetley of teacher characteristics and pupil reading results in a small urban centre. She used an analysis of covariance with reading scores adjusted for both intelligence and previous reading achievement and found a significant relationship between pupil achievement and extra training in the teaching of

⁸Wasylyk, op. cit., pp. 78-79.

⁹Klufas, op. cit., pp. 69-74.

reading, but an insignificant relationship between pupil achievement and years of general training. When she investigated teacher experience she found that in different grades, different ranges of experience were significantly related to pupil achievement. However, at both the Grade IV and Grade VI levels, experience over ten years was significantly related to lower achievement. Tetley found female teachers had better results in Grade IV and male teachers in Grade VI. She found the age of the teacher was not significantly related to reading achievement.¹⁰

Greenfield, in a study of systems analysis as it applies to the field of education, found organization in educational systems has significant effects upon achievement. Using analysis of variance, he determined that sixty-eight per cent of the variance in achievement scores was related to differences between pupils within the classes. The other thirty-two per cent was associated with differences between classes, schools, and districts; these sources accounted for nineteen per cent, three per cent, and ten per cent, respectively. This study would indicate, then, that most of the variance in achievement can be expected to

¹⁰Dorothy Fern Tetley, "The Relationship of Certain Teacher Characteristics to Pupil Achievement in Reading" (unpublished Master's thesis, The University of Alberta, Edmonton, 1964), pp. 46-56.

result from pupil variables but that a smaller, though significant, relationship with other variables can also be expected.¹¹

II. STUDIES ON RELATIONSHIP BETWEEN AGE AND ACHIEVEMENT OF PUPILS

A wide chronological age difference will exist in a classroom for two reasons: children enter school at different ages, and children are sometimes required to repeat grades. In the latter case it would probably be safe to assume that, as a group, children who have been required to repeat, and are therefore overage, would achieve at a lower level in any one year than would children of normal age for that grade. The fact that they had in the past been required to repeat would ordinarily indicate a tendency to achieve at a lower rate. More will be said about the rate of achievement following failure in the section on non-promotion.

Considerable research has been conducted with children young for their grade because they entered school before the normal age. Miller studied 665 fifth-grade children in 1955 in Illinois and found that forty per cent of the pupils

¹¹Thomas Barr Greenfield, "Systems Analysis in Education: A Factor Analysis and Analysis of Variance of Pupil Achievement" (unpublished Doctoral thesis, The University of Alberta, Edmonton, 1963).

young for their grade were among the top fourth; whereas, only six per cent were in the bottom fourth.¹² In a similar type of study, King found that a younger group did not achieve as well as an older group.¹³ She used as the younger group those students who had entered grade one between the ages of five years, eight months and five years, eleven months; whereas the older group had entered between six years, five months and six years, eight months. She also found that the younger group had a higher number of students who subsequently were required to repeat a grade and who showed an indication of poor social and personal adjustment in school. Hamalainen in a survey of Nassan County schools found that both under-age and over-age children face more school problems than children of normal age.¹⁴ Dickinson and Larson discarded repeaters from their study of Grade IV pupils and found that in spite of the younger children having higher IQ's than the older children, they were still not able to achieve as well as the older children with

¹²Vera V. Miller, "Academic Achievement and Social Adjustment of Children Young for Their Grade Placement," The Elementary School Journal, LVII (February, 1957), pp. 257-63.

¹³Inez B. King, "Effect of Age of Entrance in Grade I Upon Achievement in Elementary School," The Elementary School Journal, LV (February, 1955), pp. 331-36.

¹⁴Arthur E. Hamalainen, "Kindergarten Primary Entrance Age in Relation to Later School Adjustment," The Elementary School Journal, LII (March, 1952), pp. 406-11.

lower IQ's.¹⁵

One of the factors which would influence results of studies of this type is whether or not pupils are admitted young on the basis of a readiness test. Besides this need for clarification, there is considerable difference in the findings of research on age differences in the classroom and, consequently, a need for additional study.

III. STUDIES ON RELATIONSHIP BETWEEN SEX AND ACHIEVEMENT OF PUPILS

The Edmonton Continuous Progress Plan in operation in Edmonton requires the placement of pupils on one of three programmes: a five-year programme for superior students, a six-year regular programme for average achieving students, or a seven-year programme for slower learners. A look at the statistics compiled by W. R. Prunkl for a report on the plan reveals that of the pupils placed in the five-year programme 56.71% were girls; whereas, of those placed in the seven-year programme only 34.44% were girls.¹⁶ These

¹⁵Donald J. Dickinson and J. Donald Larson, "The Effects of Chronological Age in Months on School Achievement," The Journal of Educational Research, LVI (May-June), pp. 492-93.

¹⁶A. Carmichael, D. Cooney, and W. R. Prunkl, "A Summary of The Edmonton Continuous Progress Plan" (Edmonton: Edmonton Public School Board, 1965), pp. 24-25. (Mimeographed.)

statistics indicate that in the Edmonton elementary schools the girls achieve at a higher level than do the boys.

Most research agrees that elementary school girls show general superiority on standardized achievement tests over elementary boys. However, at the secondary level, the evidence is not nearly so weighted. Schunert¹⁷ found that boys exceeded girls in geometry at the secondary level and Clark¹⁸ throws some doubt on the significance of findings at both levels. He found that sex difference in ability do not exist and although girls exceeded boys in the language arts, there was no significant difference in reading and arithmetic. Parsley, Powell, and O'Connor in a study in Grades IV to VIII found that girls excelled boys in Reading and Arithmetic Fundamentals but boys did better in Arithmetic Reasoning.¹⁹

The findings of Stroud and Lindquist seem to be representative of most of the research in the field:

¹⁷Jim Schunert, "The Association of Mathematical Achievement with Certain Factors Resident in the Teacher, in the Teaching, in the Pupil, and in the School," Journal of Experimental Education, XIX (March, 1951), p. 233.

¹⁸Willis W. Clark, "Boys and Girls--Are There Significant Ability and Achievement Differences," Phi Delta Kappan, XLI (November, 1959), pp. 73-76.

¹⁹Kenneth M. Parsley, Jr., Marvin Powell, and Henry A. O'Connor, "Further Investigation of Sex Differences in Achievement of Under-, Average-, and Over-Achieving Students Within Five IQ Groups in Grades Four Through Eight," The Journal of Educational Research, LVII (January, 1964), p. 269.

In the Iowa Every-Pupil Basic Skills Testing Program (for Grades III-VIII) girls have maintained a consistent and, on the whole, significant superiority over boys in the subjects tested, save in arithmetic, where small, insignificant differences favor boys. These findings corroborate previous investigations in both these respects. On the other hand, in the Iowa Every-Pupil High School Testing Program the advantages just as definitely have gone to the boys, two exceptions being in algebra and reading comprehension, where small and on the whole not significant differences favor the girls.²⁰

The issue is further confused by the variance in definition of elementary and secondary levels. The present study involved Grade VII in the elementary school whereas in the schools used in past studies Grade VII was in the elementary school for some investigations and in the secondary school for others. The Encyclopedia of Educational Research indicated the variation in organization that exists:

Although the 6 - 6, 6 - 3 - 3, and 8 - 4 divisions are most common, one may think of the elementary school as including either six or eight grades and can point to many examples of both in all parts of the United States.²¹

²⁰J. B. Stroud and E. F. Lindquist, "Sex Differences in Achievement in the Elementary and Secondary Schools," The Journal of Educational Psychology, XXXIII (December, 1942), pp. 665-66.

²¹Harold G. Shane and James Z. Polychrones, "Elementary Education--Organization and Administration," Encyclopedia of Educational Research (Third Edition), p. 424.

IV. STUDIES ON RELATIONSHIP BETWEEN MOBILITY AND ACHIEVEMENT OF PUPILS

One of the first studies in transiency of pupils was a study by Sackett which used the matched-pairs technique to compare students native to the Panama Canal Zone with those who had attended school outside of the Canal Zone. His data indicated that transient children excelled in all subjects measured except arithmetic computation. He suggested that the result obtained might have been influenced by such factors as home environment, opportunity for travel, and superior schools in place of origin.²²

In a study of Grade IX achievement in Alberta, Nyberg concluded that when a pupil in grade nine transfers from one school to another his final mark in Social Studies will be lower than if he had not moved. The data did not reveal significant relationships between mobility and examination results in any other subjects, however.²³

A recent Alberta study with Grade Six pupils in the

²²Everett B. Sackett, "The Effect of Moving on Educational Status of Children," The Elementary School Journal, XXXV (March, 1935), pp. 517-26.

²³Verner R. Nyberg, "A Study to Determine the Effect of Transiency on Grade IX Departmental Examination Marks" (unpublished Master's thesis, The University of Alberta, Edmonton, 1956), p. 37.

Edmonton R. C. Separate School System by Sister Annata Brockman found that the achievement of transient girls was significantly lower in three of five subjects than that of non-transient girls. However, she found transiency did not affect the achievement of boys in any subject other than language until after the third transfer.²⁴

V. STUDIES ON RELATIONSHIP BETWEEN SOCIO-ECONOMIC STATUS OF FATHERS AND ACHIEVEMENT OF PUPILS

There seems no doubt that socio-economic factors do affect the achievement of pupils. It is also apparent that this relationship is not the result of differences in intelligence. In reporting the results of extensive survey research by the United States Office of Education, Baer stated: "Students' ability, however, as measured by placement tests, bore almost no relationship to family income."²⁵

Two of the many studies in this field show the relationship that appears to exist between social and economic factors and pupil achievement. Milner found a

²⁴Sister Mary Annata Brockman, "Relationship Between Transiency and Test Achievement of Grade Six Students" (unpublished Master's thesis, The University of Alberta, Edmonton, 1965), pp. 76-80.

²⁵Max F. Baer, "Effects of Low Income on Children," Personnel and Guidance Journal, XXXIX (April, 1961), p. 28.

high relationship between low scoring and lower-class status and high scoring and middle-class status in a study involving the reading readiness of children entering school.²⁶ Keough in a study of achievement of arithmetic in the elementary school found a positive relationship between social and economic factors and achievement.²⁷

VI. STUDIES ON RELATIONSHIP BETWEEN PAST NON-PROMOTION AND ACHIEVEMENT OF PUPILS

Journals and textbooks are replete with evidence that non-promotion serves no useful purpose in education and is, in fact, a harmful and wasteful practice. The evidence, however, has had little effect on the promotional policies of many provinces, school districts, and schools. Four articles are reviewed to illustrate the numerous findings in this area.

Cook stated that proponents of non-promotional policies claimed three advantages for their policies:

²⁶Esther Milner, "A Study of the Relationship Between Reading Readiness in Grade One School Children and Patterns of Parent-Child Interaction," Child Development, XXII (June, 1951), p. 107.

²⁷John L. Keough, "The Relationship of Socio-Economic Factors and Achievement in Arithmetic," The Arithmetic Teacher, VII (May, 1960), p. 234.

(1) the range of abilities in the next grade will be reduced, (2) the pupil achievement in relation to ability will be higher, and (3) the average grade standards will be higher.²⁸ He conducted a study to test these hypotheses and found that they were not substantiated. He also found that in schools with high non-promotional ratios, the mean intelligence of the classes is reduced and the average achievement for the classes is significantly lowered because over-age students are kept in the upper classes of the school.²⁹

In an article relating work in child psychology to promotional policies, Otto made three significant statements:

If absurd extremes are avoided, exact grade placement has little or no bearing on the educational development a child will make during a given year. . . .

Repetition of grades has no special educational value for children. . . .

Standards are highest in school systems with high promotional rates.³⁰

Although the article did not give references for each statement made, the writer assured the reader that he was

²⁸Walter W. Cook, "Some Effects of the Maintenance of High Standards of Promotion," The Elementary School Journal, XLI (February, 1941), p. 430.

²⁹Ibid., p. 437.

³⁰Henry J. Otto, "Findings in Child Psychology Should Affect Grading and Promotion Policies," NEA Journal, XL (February, 1951), p. 128.

prepared to substantiate each statement by reference to research completed. Coffield and Blommers in a study of the effects of non-promotion in the elementary school found that:

The educational progress of seventh grade pupils who have experienced failure once is typically on a par with that of matched promoted seventh grade pupils who have spent one year less in school.³¹

Kamii and Weikart compared those grade seven students who had been failed once in elementary with those who had not failed. They showed that, in general, retention does not help a student.³²

The research on the effects of non-promotion was aptly summarized by Herrick in the Encyclopedia of Educational Research:

. . . Children who are not promoted do no better than children of like ability who are promoted. . . . Nonpromotion practices do not reduce the range of specific abilities with which the teacher has to cope. . . . The threat of nonpromotion does not cause the threatened children to achieve more than those who are not threatened. . . . The failing (nonpromoted) child is more likely to quit school, to be in difficulty with school authorities, to receive less satisfaction from his school work, and to be antagonistic. . . . The nonpromoted

³¹William H. Coffield and Paul Blommers, "Effects of Non-Promotion on Educational Achievement in the Elementary School," The Journal of Educational Psychology, XLVII (April, 1956), pp. 235-50.

³²Constance K. Kamii and David P. Weikart, "Marks, Achievement, and Intelligence of Seventh Graders Who Were Retained (Nonpromoted) Once in Elementary School," The Journal of Educational Research, LVI (May-June, 1963), p. 457.

child has greater difficulty in making satisfactory social adjustment than the promoted child of the same ability.³³

VII. STUDIES ON RELATIONSHIP BETWEEN YEARS OF TEACHER EDUCATION AND ACHIEVEMENT OF PUPILS

Research on the relationship of the number of years of professional education of the teacher to the achievement of pupils has not been conclusive. As reported earlier Lindstedt³⁴, Eddy³⁵, and Wasylyk³⁶ found significant relationships between these two variables. Ellis, too, found that highly rated teachers had completed a greater quantity of preparation in their overall program.³⁷ On the other hand, McCall and Krause reported:

Training, an almost universally employed basis for evaluating teacher merit and fixing salaries, was somewhat better than drawing shuffled names out of a hat (.13).³⁸

³³Virgil E. Herrick, "Elementary Education--Programs," Encyclopedia of Educational Research (Third Edition), p. 439.

³⁴Lindstedt, loc. cit.

³⁵Eddy, loc. cit.

³⁶Wasylyk, loc. cit.

³⁷Joseph R. Ellis, "Relationships Between Aspects of Preparation and Measures of Performance of Secondary Teachers of the Social Studies," The Journal of Education Research, LV (September, 1961), pp. 24-28.

³⁸William A. McCall and Gertrude R. Krause, "Measurement of Teacher Merit for Salary Purposes," The Journal of Educational Research, LIII (October, 1959), pp. 73-75.

Neither Klufas³⁹ nor Tetley⁴⁰, in their studies reported previously, found any significant relationship between teacher education and pupil achievement.

A number of studies have investigated the relationship between pupil results in a subject field and the academic preparation of the teacher in that field. Lindstedt observed that the number of university-level mathematics courses taken did not produce a significant difference in results.⁴¹ On the other hand, Barr found that the knowledge of subject matter, which he confined to the area in which the teacher was teaching, was significantly associated with teaching ability.⁴² Also, the results of study by Hughes showed that:

. . . pupils who were taught by teachers who had majored in college physics excelled in average achievement the pupils who were taught by teachers who had not majored in college physics.⁴³

Ackerman resolved these two opposing ideas by concluding that although certain highly technical areas seem to

³⁹Klufas, loc. cit.

⁴⁰Tetley, loc. cit.

⁴¹Lindstedt, loc. cit.

⁴²A. S. Barr, et al., The Measurement of Teaching Ability (Madison, Wisconsin: Dembar Publications, Inc.) 1945, p. 50.

⁴³J. M. Hughes, "A Study of Intelligence and of the Training of Teachers as Factors Conditioning the Achievement of Pupils," School Review, XXXIII (April, 1925), p. 302.

require the training of the teacher in his subject area, most training in subject matter areas seems to have little effect on pupil achievement.⁴⁴

VIII. STUDIES ON RELATIONSHIP BETWEEN YEARS OF EXPERIENCE AND AGE OF TEACHERS AND ACHIEVEMENT OF PUPILS

The relationship between the age and experience of the teacher and pupil achievement has not been made clear by past research. Some studies have indicated a positive relationship, some a negative one, and still others seem to indicate a curvilinearity with positive correlation early in the teaching career followed by negative correlation later.

It is difficult to separate the effects of experience from those of maturity. Stephens and Lichtenstein however, made an attempt to do so and found a slight positive correlation of pupil achievement with teacher experience and a slight negative correlation of pupil achievement with teacher age.⁴⁵ This finding with respect to the age of the teacher agrees with the conclusion reached by Rolfe that

⁴⁴Walter I. Ackerman, "Teacher Competence and Pupil Change," Harvard Educational Review, XXIV (Fall, 1954), pp. 273-89.

⁴⁵J. M. Stephens and Arthur Lichtenstein, "Factors Associated with Success in Teaching Grade Five Arithmetic," The Journal of Educational Research, XL (May, 1947), p. 1963.

there was no significant relationship between the age of the teacher and pupil change.⁴⁶ However, Brookover found that pupil gains improved as teachers aged up to the age of thirty-eight and decreased thereafter.⁴⁷ He also found that the greatest pupil gains took place for teachers between the ages of twenty-seven and thirty-eight. Tetley, on the other hand, found no significant relationship between the age of the teacher and pupil achievement in reading.⁴⁸

Although Alberta studies which found a significant positive correlation between teacher experience and pupil achievement outnumber those which did not, studies in the United States which found little or no correlation seem to outnumber those which find a significant positive correlation. McCall and Krause, whose study is referred to earlier, found that years of service showed a zero correlation with merit.⁴⁹ This finding corroborated a similar conclusion by

⁴⁶J. F. Rolfe, "The Measurement of Teaching Ability, Study No. 2," Journal of Experimental Education, XIV (1945), pp. 52-74, cited by Walter I. Ackerman, "Teacher Competance and Pupil Change," Harvard Educational Review, XXIV (Fall, 1954), p. 274.

⁴⁷W. B. Brookover, "The Relation of Social Factors to Teaching Ability," Journal of Experimental Education, XIII (1945), pp. 191-205, cited by Walter I. Ackerman, "Teacher Competance and Pupil Change," Harvard Educational Review, XXIV (Fall, 1954), p. 275.

⁴⁸Tetley, loc. cit. ⁴⁹McCall and Krause, loc. cit.

Barr and his associates.⁵⁰ Ackerman reviewed the results of four major studies and found little justification for the accepted principle that experienced teachers do a better job of teaching.⁵¹ A slight departure from this trend away from popular belief was referred to by Domas and Tiedeman in reference to a study by Davis:

Teachers with two or more years of experience were more successful in having their pupils pass the Minnesota State Board Tests than were teachers with one year of experience, but teachers with more than two years' experience had little or no advantage over those with two years' experience.⁵²

The opposite result came from a study by Schunert, who found that classes taught by teachers who had more than eight years of experience exceeded the achievement of classes taught by teachers of less experience. He found, however, that there was no significant difference between classes of teachers with one year of experience and those of teachers with two to eight years of experience.⁵³

Schunert's finding was supported by most of the Alberta studies reported earlier. Lindstedt⁵⁴,

⁵⁰Barr, et al., op. cit., p. 65 ⁵¹Ackerman, loc. cit.

⁵²H. McVey Davis, The Use of State High School Examinations as an Instrument for Judging the Work of Teachers. Teachers College Contributions to Education, No. 611 (New York: Columbia University, 1934), p. 101, cited by Dimeon J. Domas and David V. Tiedeman, "Teacher Competence: An Annotated Bibliography," Journal of Experimental Education, XIX (December, 1950), pp. 101-218.

⁵³Schunert, loc. cit. ⁵⁴Lindstedt, loc. cit.

Eddy⁵⁵, Wasylyk⁵⁶, and Klufas⁵⁷ all reported that teacher experience and pupil achievement were significantly related. Tetley, on the other hand, found different results at different grade levels. At both the Grade IV and Grade VI level, however, she found experience over ten years was significantly related to lower achievement. Two to five years of teaching experience was significantly effective at the Grade V level while five to ten years' experience produced significantly superior results for Grade IV teachers.⁵⁸

IX. STUDIES ON RELATIONSHIP BETWEEN TEACHER SEX AND ACHIEVEMENT OF PUPILS

Studies are scarce in this area but Ryans in an article for the Encyclopedia of Educational Research reports the following:

Sex differences in teacher effectiveness do not appear to be pronounced among elementary teachers, although at the secondary level it appears that women as a group may be more effective than men as a group on specified criterion dimensions.⁵⁹

Ryans' observations at the secondary level are substantiated to some degree by Cheydleur's research at the University

⁵⁵Eddy, loc. cit.

⁵⁶Wasylyk, loc. cit.

⁵⁷Klufas, loc. cit.

⁵⁸Tetley, loc. cit.

⁵⁹David G. Ryans, "Prediction of Teacher Effectiveness," Encyclopedia of Educational Research (Third Edition), p. 1490.

level. In a study of first and second year French teachers, Cheydleur found that students of women teachers achieved slightly more, in general, than did students of men teachers. However, the evidence was too close to be very conclusive.⁶⁰

The inconclusiveness of these studies is maintained by the two Alberta studies with findings on this topic. Eddy⁶¹ found no significant relation between achievement in Grade IX social studies and the sex of the teacher; whereas Tetley⁶² found female teachers had better results in Grade IV, male teachers in Grade VI, and no significant differences in Grade V.

X. STUDIES ON RELATIONSHIP BETWEEN SCHOOL SIZE AND ACHIEVEMENT OF PUPILS

Most experiments conducted to find whether or not the size of school is related to the achievement of its pupils have been in the secondary schools. Both Hughes⁶³ and Schunert⁶⁴, referred to elsewhere in this chapter, found that pupils in large high schools achieve better results

⁶⁰Frederic D. Cheydleur, "Judging Teachers of Basic French Courses by Objective Means at the University of Wisconsin--1919 - 1943," Journal of Educational Research, XXXIX (November, 1945), p. 182.

⁶¹Eddy, loc. cit.

⁶²Tetley, loc. cit.

⁶³Hughes, op. cit., p. 300.

⁶⁴Schunert, loc. cit.

than do pupils in small high schools. Hughes defined a large high school as one over 550 pupils and Schunert used schools enrolling 100 to 500 pupils as large schools in his study. This lack of uniformity in defining the size of a large school makes the comparison of studies difficult. Barr, in his study described earlier, found that the size of the school, or number of pupils in the school, was one of the criteria which seemed to possess most value as a measure of teaching ability, or pupil growth, and achievement. He found a correlation between them of .31.⁶⁵ These studies were supported by Eddy who found a significant relationship between achievement and the size of the school in his study.⁶⁶

XI. STUDIES ON RELATIONSHIP BETWEEN CLASS SIZE AND ACHIEVEMENT OF PUPILS

It is popular belief that learning proceeds best when classes are small. A number of studies have been carried out over the years to determine the relation that exists between class size and pupil achievement. The results are inconclusive and lead one to suspect that more studies are needed to establish a clear relationship. In 1955, Blake

⁶⁵Barr, et. al., op. cit., p. 74

⁶⁶Eddy, loc. cit.

examined eighty-five pieces of research on class size and found that thirty-five of them showed that smaller classes resulted in better achievement, eighteen showed that larger classes resulted in better achievement, and in thirty-two of the studies the researcher would not claim he had made a case either way.⁶⁷ McKenna summarized the view of those researchers who have made a case for smaller classes:

. . . the fifteen years of work . . . in the class-size field have provided us with the knowledge that more good educational experiences take place in smaller classes than in larger ones.⁶⁸

Not all researchers, however, agree with the findings of Blake and McKenna. In his Alberta study, Eddy found that the size of the class was not significantly related to achievement.⁶⁹ The Barr study, referred to several times in this review of related literature, found that the size of the class did not give significant results as a measure of pupil growth and achievement.⁷⁰ Cammarosano and Santopolo

⁶⁷Howard V. Blake, "Class Size: A Summary of Selected Studies in Elementary and Secondary School." (New York: Ed. D. Project, Teachers College, Columbia University, 1954), cited by D. H. Ross and B. McKenna, Class Size: The Multi-Million Dollar Question (New York: Metropolitan School Study Council, 1955).

⁶⁸B. H. McKenna, "What Research says about Greater Learning in Smaller Classes," NEA Journal, CLVI (October, 1957), pp. 437-38.

⁶⁹Eddy, loc. cit. ⁷⁰Barr, et. al., op. cit., p. 65

conducted an experiment at the university level and found that with classes of thirty and sixty there was no significant difference in class achievement.⁷¹ Conducting an experiment in Illinois under a Ford Foundation grant to explore the advantages and disadvantages of various class sizes, Andree used large classes with small seminars, interview schedules, and techniques of team teaching. In a subjective evaluation he established that teacher creativity had been stimulated and that the large classes were very productive when the teachers met in conference before each class.⁷² A study by Stevenson was one of the best controlled experiments in the area of class size. He used tests before and after the period of experimentation to arrive at a measure of pupil change, and to reduce the influence of the teacher's personality and method, he had each teacher take a small class for one semester and a large one for the other. The following statements represent some of his findings:

From a study of the data for grades II, V, and VII, it is evident that the second-grade pupils received more efficient instruction when taught in groups of less than forty-five than they did when the size of classes was increased beyond this point. The reverse was true for

⁷¹Joseph R. Cammarosano and Frank A. Santopolo, "Teaching Efficiency and Class Size," School and Society, LXXXVI (September 27, 1958), pp. 338-41.

⁷²Robert G. Andree, "Large Classes and Effective Teaching," Clearing House, XXXIII (February, 1959), pp. 334-36.

grade V and VII, since increasing the size of groups to forty-five in the seventh grade and to forty-eight in the fifth grade increased the advantages of the large groups over the small ones.

The law of diminishing returns, therefore began to operate in the case of the second grade sometime before the size of class reached forty-five. No similar statement can be made in reference to grade V and VII, since the gains actually increased as the size of the classes increased up to forty-five for the seventh grade and up to forty-eight for the fifth grade.⁷³

A study by Marklund showed that class size and homogeneity were not significantly related to achievement, but Marklund suggested that if class size and homogeneity are used to enhance pedagogical opportunities and to take advantage of methods of studying and teaching, then perhaps significant differences would result.⁷⁴

Hollingsworth aptly summarized the research to date:

The issue of class size is still with us today. According to research, achievement in skills as measured by standardized tests are not affected by the size of the class. In measuring things other than scholastic achievement, it seems small classes are important.⁷⁵

⁷³P. R. Stevenson, Class-Size in the Elementary School, (Columbus: The Ohio State University, 1925), p. 31.

⁷⁴Sixten Marklund, "Scholastic Attainment as Related to Size and Homogeneity of Class," Educational Research, VI (November, 1963), p. 67.

⁷⁵Paul M. Hollingworth, "The Issue of Class Size," Education, LXXXIV (March, 1964), p. 435.

XII. STUDIES ON RELATIONSHIP BETWEEN NUMBER OF GRADES PER CLASSROOM AND ACHIEVEMENT OF PUPILS

Studies by Finley and Thompson and by Dreier related directly to this problem. Using the matched-pairs technique, Finley and Thompson found that there were no differences in the achievement of rural school children, whether they were educated in a single-graded or multi-graded school environment.⁷⁶ Dreier also determined that pupils from graded and ungraded elementary schools do not differ significantly in achievement.⁷⁷ Bodnaruk, in a study in Alberta, found no significant difference between results on Grade IX and Grade XII Departmental examinations obtained in a town school and those obtained in rural schools.⁷⁸

The results of the first three studies presented in this section are contradicted by the final study reviewed.

⁷⁶Carmen J. Finley and Jack M. Thompson, "A Comparison of the Achievement of Multi-Graded and Single-Graded Rural Elementary School Children," The Journal of Educational Research, LVI (May-June, 1963), p. 475.

⁷⁷William H. Dreier, "The Differential Achievement of Rural Graded and Ungraded School Pupils," The Journal of Educational Research, XLIII (November, 1949), pp. 175-86.

⁷⁸Wm. A. Bodnaruk, "A Comparative Study of Examination Results in Grades Nine and Twelve in One Town School and in Three Rural Centralized Schools in the County of Ponoka" (unpublished Master's thesis, The University of Alberta, Edmonton, 1962).

Truckey compared single grade and multi-grade classes in Alberta and concluded that, on the average, students in single grade classes did significantly better in Grade Nine Departmental examinations than did students in multi-grade classes.⁷⁹

XIII. SUMMARY

The literature reviewed in this chapter suggests certain results that might be expected in a study such as the present one.

Investigations of the variable pupil age have been inconclusive partly because the underlying reasons for age differences vary. Since underaged pupils have been found to achieve at a lower rate because of their earlier entrance age and overaged pupils are likely to achieve at a lower rate as shown by past non-promotion, a lack of significant correlation between age and achievement would be expected. Past studies indicate that in the elementary school girls are better achievers than boys and hence a significant correlation between the sex of the pupils and their achievement has often been found. Studies on mobility have

⁷⁹Lawrence A. Truckey, "Comparison of Achievement of Grade Nine Students in Selected Single Grade and Multi-Grade Classes in Alberta" (unpublished Master's thesis, The University of Alberta, Edmonton, 1964).

been inconclusive and do not give a clear indication of expected results. That the socio-economic status of the father does relate to achievement is clearly indicated in the review. Since the students who were retained in past years are likely the slower learners, and since past studies have shown retention to be a wasteful practice, one would expect past non-promoted pupils to continue to achieve at a lower rate.

The review of studies investigating the teacher variables indicates that significant correlations with achievement are not probable. The Alberta studies did, however, indicate a significant relationship between achievement and the education and experience of the teacher.

Studies on school size as a predictor of pupil achievement have found a significant relationship. Studies on class size continue to be split in their findings and do not give a clear indication of expected results in a study such as the present. Most of the studies investigating the correlation between achievement and the number of grades per classroom have indicated no significant differences.

CHAPTER III

ANALYSIS AND INTERPRETATION OF DATA

The analysis and interpretation of the data are reported in two sections under the titles: preliminary analysis and testing the null hypotheses. The analysis and interpretation of the data are described in detail in each section with the investigation of each null hypothesis treated separately in the second section.

I. PRELIMINARY ANALYSIS

In order to determine the type of regression that would be most appropriate, certain preliminary analyses were necessary. Pearson product-moment correlation coefficients were found for all the possible combinations of four of the pupil variables; i. e., achievement, age, intelligence quotient, and socio-economic status. The remaining three pupil variables were not used in this preliminary analysis because they are dichotomous and hence could not be meaningfully used in a multiple regression equation.

Table I indicates that all six of the possible combinations correlated significantly. Since intelligence and achievement had the highest correlation coefficient,

TABLE I

LINEAR CORRELATION OF AGE, INTELLIGENCE QUOTIENT,
SOCIO-ECONOMIC STATUS, AND ACHIEVEMENT

VARIABLES	CORRELATION r	SIGNIFICANCE	
		t	LEVEL
Intelligence:Achievement	.8234	31.8384	.01
Age:Achievement	-.5289	13.5139	.01
Soc-Ec Stat:Achievement	-.2311	5.1713	.01
Age:Intelligence	-.6540	18.8326	.01
Intelligence:Soc-Ec Stat	-.2189	4.8841	.01
Soc-Ec Stat:Age	.2392	5.3633	.01

$r = .8234$, the intelligence quotient was chosen as the first predictor variable. The two remaining possibilities as predictors, age and socio-economic status, were then tested by two means to determine their efficiency as predictors. The first method of testing their efficiency was to combine each of them with intelligence and correlate with achievement to calculate a multiple correlation coefficient. The formula used was $R = \sqrt{\beta_2 r_{12} + \beta_3 r_{13}}$, where β_2 and β_3 are the beta weights as given in Table II and r_{12} and r_{13} are the correlation coefficients taken from Table I.¹ Once the multiple correlation coefficient was found, it was compared to the linear correlation coefficient for the relationship between intelligence and achievement, $r = .8234$, to determine the increase in efficiency. Table II indicates the multiple correlation coefficients of $R = .8235$ when age and intelligence are combined as predictors and $R = .8251$ when socio-economic status and intelligence are combined. These results indicated that age did not improve prediction and socio-economic status improved it slightly.

A second method of showing the amount contributed by each of these two variables to the efficiency of prediction is to examine partial correlation. Partial correlation gives

¹George A. Ferguson, Statistical Analysis in Psychology and Education (New York: McGraw-Hill Book Company, Inc., 1959), pp. 292-95.

TABLE II

MULTIPLE CORRELATION OF AGE, INTELLIGENCE, AND
SOCIO-ECONOMIC STATUS WITH ACHIEVEMENT

COMBINATION	VARIABLES	BETA WEIGHTS	COEFFICIENT
I	1 Achievement 2 Intelligence 3 Age	$\beta_2 = .834375$ $\beta_3 = .016775$	R = .8235
II	1 Achievement 2 Intelligence 3 Soc-Ec Stat	$\beta_2 = .811694$ $\beta_3 = -.053462$	R = .8251

the residual relationship between age or socio-economic status and achievement when the common influence of intelligence has been removed. The formula for partial correlation is

$$r_{12.3} = \frac{r_{12} - r_{13}r_{23}}{\sqrt{(1 - r_{13}^2)(1 - r_{23}^2)}}$$

where $r_{12.3}$ is the partial correlation coefficient and r_{12} , r_{13} , and r_{23} the respective correlation coefficients.² The partial correlation coefficient for age and achievement with intelligence removed is .022, which is not significant using the distribution of t to test significance (see Table III). Using partial correlation to find the residual relationship between achievement and socio-economic status when the common influence of intelligence has been removed resulted in a coefficient of $r = -.166$. As Table III indicates, this coefficient is significant at the .01 level of significance.

The results of the partial correlations served to substantiate the conclusions drawn from the results of the multiple correlations; that is, age is not independently related to achievement but socio-economic status is.

On the basis of these results, a regression was chosen which would predict achievement from the intelligence quotient of the pupil and the socio-economic status of the father. The formula, developed in Chapter I is

²Ferguson, op. cit., pp. 290-91.

TABLE III

PARTIAL CORRELATION OF AGE AND SOCIO-ECONOMIC STATUS
WITH ACHIEVEMENT WHEN INTELLIGENCE IS REMOVED

COMBINATION	VARIABLES	CORRELATION	SIGNIFICANCE	
		r	t	LEVEL
I	1 Achievement 2 Age 3 Intelligence	.022	.480	NS
II	1 Achievement 2 Soc-Ec Stat 3 Intelligence	-.166	3.64	.01

$X_1' = 6.1645 X_2 - .0333 X_3 + 13.43$ where X_1' is the predicted achievement mean for the class, X_2 is the mean of the intelligence quotients for the class, and X_3 is the mean of the socio-economic status scores for the class.³ The calculated predicted achievement means for the classes are given in Table XI of Appendix A.

A modified achievement mean indicating the extent the actual achievement mean differed from the predicted achievement mean was needed for each class. To find this modified achievement mean, the predicted achievement mean was subtracted from the actual achievement mean. The modified achievement means were used directly for correlation where rank-order correlation was appropriate. However, for ease of handling with product-moment correlations, the modified achievement means were transformed into T-scores.

II. TESTING THE NULL HYPOTHESES

Achievement and pupil age. Table I shows that there is a significant negative correlation of $-.5289$ between the ages of the pupils and their achievement.⁴ The null hypothesis

At the .05 level of significance, there is no significance to the correlation between the achievement of Grade VII pupils and the age of the pupils

was therefore rejected. However, subsequent analysis by

³Supra, pp. 14-15.

⁴Supra, p. 46.

multiple and partial correlation showed that this correlation results from a correlation of age and intelligence.⁵

Achievement and pupil sex. Table IV indicates the correlation between the sex of the pupil and his achievement as $r_{pbi} = .0309$, which is not significant. The null hypothesis

At the .05 level of significance, there is no significance to the correlation between the achievement of Grade VII pupils and the sex of the pupils was therefore accepted.

Achievement and pupil mobility. The correlation between pupil achievement and whether or not a pupil moves during his first seven grades is $r_{pbi} = .018$. Since this is not a significant correlation, the null hypothesis

At the .05 level of significance, there is no significance to the correlation between the achievement of Grade VII pupils and pupil mobility was accepted.⁶

Achievement and socio-economic status. Table I indicates⁷ that the correlation coefficient for the achievement of the pupil and the socio-economic status of the father is $-.2311$. The correlation is negative because of the

⁵Supra, pp. 47-49.

⁶See Table IV, p. 53.

⁷Supra, p. 46.

TABLE IV
CORRELATION OF SEX, MOBILITY, AND
NON-PROMOTION WITH ACHIEVEMENT

VARIABLES	CORRELATION r_{pbi}	SIGNIFICANCE	
		t	LEVEL
Sex: Achievement	.0309	.65	NS
Mobility: Achievement	.018	.39	NS
Past Non-Prom: Achievement	.4698	11.59	.01

scale used for socio-economic status.⁸ The correlation was found to be significant and, hence, the null hypothesis

At the .05 level of significance, there is no significance to the correlation between the achievement of Grade VII pupils and the socio-economic status of the fathers

was rejected. Subsequent investigation showed that some, but not all, of this correlation was the result of the common effect of the intelligence quotient. The residual correlation between achievement and socio-economic status remained significant after the common effect of the intelligence quotient had been removed.⁹

Achievement and past non-promotion. A positive, significant correlation, $r = .4698$, between the achievement of the pupil and whether or not he had been retained, or not promoted, in his first seven grades in school is indicated in Table IV. Hence the null hypothesis

At the .05 level of significance, there is no significance to the correlation between the achievement of Grade VII pupils and past non-promotion

was rejected.

Achievement and intelligence. The highest single-variate correlation coefficient found in the study, $r = .8234$, was found for the correlation between intelligence and achievement. As Table I indicates, this correlation is

⁸For explanation see definition for socio-economic status on page 9.

⁹Supra, pp. 47-49.

significant at the .01 level of confidence and hence the null hypothesis

At the .05 level of significance, there is no significance to the correlation between the achievement of Grade VII pupils and the pupils' intelligence quotients

is rejected.¹⁰

Modified achievement and professional education of teachers. A rank-order correlation, Spearman r_s , was used to determine the correlation between the modified achievement means of the classes and the number of years of post-secondary education of the teachers.¹¹ The correlation, reported in Table V, is $r_s = .0138$. Since this correlation is not significant, the null hypothesis

At the .05 level of significance, there is no significance to the correlation between the modified achievement of Grade VII pupils and the years of post-secondary education of the teachers

was accepted.

Modified achievement and teaching experience. The rank-order correlation, Spearman r_s , was again used and a correlation of .1174 calculated.¹² Since the correlation is not significant at the .05 level, the null hypothesis

At the .05 level of significance, there is no significance to the correlation between the modified

¹⁰Supra, p. 46.

¹¹For an explanation of the Spearman r_s , see pp. 13-14.

¹²See Table V, p. 56.

TABLE V

CORRELATION OF TEACHER EDUCATION, TEACHING EXPERIENCE,
AND NUMBER OF GRADES PER CLASSROOM
WITH MODIFIED ACHIEVEMENT

VARIABLES	CORRELATION	SIGNIFICANCE	
	r_s	t	LEVEL
Teacher Education: Achievement	.0138	.0947	NS
Teaching Experience: Achievement	.1174	.8104	NS
Number of Grades per Classroom: Achievement	.0740	.5096	NS

achievement of Grade VII pupils and the years of teaching experience of the teachers

was accepted.

Modified achievement and teacher age. The correlation of the teachers' ages with the class achievement means resulted in a correlation, $r = .1608$, which was not significant.¹³ Hence, the null hypothesis

At the .05 level of significance, there is no significance to the correlation between the modified achievement of Grade VII pupils and the age of the teachers

was accepted.

Modified achievement and teacher sex. The point bi-serial correlation of pupil achievement with the sex of the teacher was .1856, which is not significant at the .05 level.¹⁴ The null hypothesis

At the .05 level of significance, there is no significance to the correlation between the modified achievement of Grade VII pupils and the sex of the teachers

was therefore accepted.

Modified achievement and years in school. Since over seventy-five per cent of the teachers had been in their schools for only one or two years, a point bi-serial correlation seemed most appropriate. Comparing the achievement of classes whose teachers were new to their

¹³See Table VI, p. 58.

¹⁴See Table VII, p. 59.

TABLE VI

CORRELATION OF TEACHER AGE, SCHOOL SIZE, CLASS SIZE,
AND MEAN AGE DEVIATIONS WITH MODIFIED ACHIEVEMENT

VARIABLES	CORRELATION	SIGNIFICANCE	
	r	t	LEVEL
Age:Achievement	.1608	1.1169	NS
School Size:Achievement	.0932	.6416	NS
Class Size:Achievement	-.0486	.1684	NS
Mean Age Deviations: Achievement	.2169	1.5226	NS

TABLE VII
CORRELATION OF THE TEACHER SEX AND
NUMBER OF YEARS IN SCHOOL WITH
MODIFIED ACHIEVEMENT

VARIABLES	CORRELATION	SIGNIFICANCE
	r_{pbi}	t LEVEL
Achievement: Teacher Sex	.1856	1.2949 NS
Achievement: Years in School	.4642	3.5929 .001

schools with the achievement of classes whose teachers had been in the school for two or more years, the point bi-serial correlation, found in Table VII, is .4642.¹⁵ Since this is significant at the .001 level, the null hypothesis

At the .05 level of significance, there is no significance to the correlation between the modified achievement of Grade VII pupils and the number of years the teachers have been in their present schools

was rejected.

Modified achievement and school size. Table VI

gives the correlation for achievement and school size as .0932.¹⁶ As this is not significant, the null hypothesis

At the .05 level of significance, there is no significance to the correlation between the modified achievement of Grade VII pupils and the size of the schools

was accepted.

Modified achievement and class size. It was

desirable to compare class size with achievement in a normal teaching situation. Hence only those fourteen classes containing a single grade were used. A lack of significance to the correlation, $r = -.0486$, is indicated in Table VI and hence the null hypothesis

At the .05 level of significance, there is no significance to the correlation between modified achievement of Grade VII pupils and the size of the classes

¹⁵Supra, p.59.

¹⁶Supra, p. 58.

was accepted.

Modified achievement and number of grades per class-room. Table V gives the correlation between the modified class achievement means and the number of grades per class-room, $r_s = .0740$.¹⁷ The coefficient is not significant and the null hypothesis

At the .05 level of significance, there is no significance to the correlation between the modified achievement of Grade VII pupils and the number of grades per classroom

was accepted.

Modified achievement and mean age deviations. The mean age of the pupils in the study was found to be 156 months. The deviation of each pupil's age from this mean was computed and the class means of these deviations were calculated. The Pearson product-moment correlation coefficient for the correlation of the class means of the age deviations with the modified achievement means is given in Table VI¹⁸ as $r = .2169$. This was not significant at the .05 level and the null hypothesis

At the .05 level of significance, there is no significance to the correlation between the modified achievement of Grade VII pupils and the deviations of the pupils' ages from the mean age

was accepted.

Summary. All but five of the null hypotheses were

¹⁷Supra p. 56.

¹⁸Supra, p. 58.

accepted. The five rejected hypotheses dealt with pupil age, the socio-economic status of the father, past non-promotion, the intelligence quotient, and the number of years the teacher had been in his present school. The conclusions and implications that can be drawn from these findings are given in Chapter IV.

CHAPTER IV

FINDINGS, CONCLUSIONS, AND IMPLICATIONS

This chapter discusses the results of the study and relates these results to expectations on the basis of comparable studies discussed in Chapter II. A few implications for educators and also some suggestions for further research are given.

I. FINDINGS AND CONCLUSIONS

Variables significantly related to achievement.

Testing the null hypotheses revealed five variables that were significantly related to achievement. These were pupil age, the socio-economic status of the father, past non-promotion, pupil intelligence, and whether or not the teacher was new to the school.

Although the pupils' ages correlated significantly with their achievement, the computation of multiple correlation coefficients and partial correlation coefficients revealed this significant correlation was the result of the third variable, intelligence, common to both age and achievement.¹ Within the limits of this study, then, the conclusion is that the age of the pupil, by itself, is not

¹Supra, pp. 47-49.

significantly related to pupil achievement. This conclusion is of limited value, however, because the study did not differentiate the reasons for varying ages in the classroom. A more useful finding may have resulted from an investigation into school entrance ages or into the achievement, social, and personal problems of pupils old for their grade as a result of failure.

The socio-economic status of the father was also significantly related to both pupil achievement and pupil intelligence. However, combining the three factors with multiple and partial correlation showed that the socio-economic status was related, by itself, to pupil achievement.² This conclusion agrees with the findings of the studies reported in Chapter II.³

The mean achievement of pupils who had been retained in the past was significantly lower than the mean achievement of pupils who had been promoted each year. This difference would have been more meaningful, however, if the design of the study had permitted a control on intelligence and socio-economic status for this correlation. Without this control it can be argued that because of intelligence and socio-economic differences the very fact that these pupils were retained in the past shows that they achieved, and

²Supra, pp. 47-49.

³Supra, pp. 27-28.

probably still achieve, at a lower rate than promoted pupils. Nevertheless, the very fact that the non-promoted group has a significantly lower mean achievement in this grade, even though they had been in school longer, may well indicate that repetition did not serve its intended purpose. This finding and conclusion are in accord with the reported studies into this problem.⁴

The highest single-variate correlation coefficient of the study, $r = .8234$, was found for the correlation of intelligence with achievement. This finding was expected but should be viewed with certain reservations. This high correlation should be accepted keeping in mind the definitions given in the study for the intelligence quotient and for pupil achievement. Also, one must recognize that the test used for measuring intelligence and the tests used for measuring the achievement level probably tested some similar skills or common abilities and hence had a correlation "built into" them.

Whether or not the teacher was spending his first year in the school was the only one of the teacher and environmental factors that was significantly related to pupil achievement. The mean achievement of classes whose teacher had been in the school for two or more years was

⁴Supra, pp. 28-31.

significantly higher than the mean achievement of classes whose teacher was new to the school.

Variables not significantly related to achievement.

The three pupil variables not significantly related to achievement were sex, mobility, and age deviations. Although the mean achievement of girls was higher than that of boys, the difference was not significant. This finding was not in agreement with most of the studies reviewed in Chapter II.⁵ Past studies on pupil transiency have been inconclusive and the present study indicates that whether or not a pupil remains in one school throughout his elementary grades has no relationship to his Grade VII achievement. The lack of significance to the correlation between the modified achievement means and the means of the age deviations showed that for this study the proportion of under- and over-aged pupils in a class does not have any relationship to the achievement level of the class.

Four of the five teacher factors were found not significantly related to modified pupil achievement. These were post-secondary education, experience, age, and sex. Education, experience, and age all showed a slight, but not significant, positive correlation with achievement. The results of three recent Alberta studies suggest that post-

⁵Supra, p. 23-25.

secondary education and pupil achievement are related in the secondary schools; however, two others and one of the American studies reported a lack of significant relationship.⁶ Moreover, comparable studies have not yet been undertaken in the elementary grades of Alberta. As was stated earlier, it is difficult to separate the effects of experience from those of age.⁷ In this study there is a possibility that each one of these variables tended to counteract the relationship to achievement of the other. If this was the case there is a need for further study in which the relationships of the two variables with achievement can be viewed separately. The lack of significant correlation of the sex of the teacher with modified pupil achievement corresponds with the results of other studies investigating this variable.⁸

The three environmental factors included in the study were not significantly related to modified pupil achievement. The finding that school size and modified achievement were not significantly correlated disagrees with most research into this problem. However, most researchers investigating the relationship have included much larger schools into their study than were included in the present study. The large

⁶Supra, pp. 31-33.

⁷Supra, p. 33.

⁸Supra, pp. 36-37.

proportion of very small schools used in the present study may have biased the results of the study. The lack of significant relationship between class size and modified pupil achievement has ample support from past studies. This finding must be regarded with caution, however, since only fourteen classes were used to investigate this variable and twelve of the fourteen classes had a range of only eight pupils.⁹ Three of the four studies reviewed in Chapter II which relate to the number of grades per classroom concur with the results obtained in this study; that is, no significant correlation exists between modified pupil achievement and the number of grades in a single classroom.¹⁰

Summary. The purpose of this study was to determine whether or not certain selected variables were related to pupil achievement. A summary of the findings obtained when these variables were correlated with pupil achievement is given in Table VIII.

These results indicate that the pupil factors, rather than the teacher and environmental factors, have the strongest relationship with pupil achievement. This conclusion is in agreement with that reached by Greenfield

⁹Supra, p. 60.

¹⁰Supra, pp. 42-43.

TABLE VIII

SUMMARY OF FINDINGS WHEN SELECTED FACTORS
ARE CORRELATED WITH PUPIL ACHIEVEMENT

FACTORS	SIGNIFICANT CORRELATION AT .05 LEVEL	NO SIGNIFICANT CORRELATION AT .05 LEVEL
A. Pupil		
1. Age		X
2. Sex		X
3. Mobility		X
4. Socio-economic status	X	
5. Past non-promotion	X	
6. Intelligence Quotient	X	
B. Teacher		
1. Years of education		X
2. Years of experience		X
3. Age		X
4. Sex		X
5. Years in present school	X	
C. Environmental		
1. Size of school		X
2. Size of class		X
3. Grades per classroom		X

as reported in Chapter II.¹¹

II. IMPLICATIONS

Educational implications of results of study. The results of this study indicate that in the search for variables that are related to pupil achievement, a major proportion of the effort should concentrate upon pupil rather than teacher and environmental variables. Since much emphasis in the past has been upon attempting to investigate and control teacher and environmental factors, there is perhaps an implication favouring a change in emphasis arising out of the present study. It may be possible that pupil achievement can be improved through a more thorough knowledge of the relationship that exists between certain pupil variables and achievement and through an attempt to place controls on some of the variables. An improvement in pupil achievement may also be possible by changing the curricula to suit better the pupil differences that cannot be controlled.

The present study investigated only one of the desired outputs of the educational system, that of pupil achievement, and at only one grade level. If these results are repeated in investigations at other grade levels and in correlations

¹¹Thomas Barr Greenfield, "Systems Analysis in Education: A Factor Analysis and Analysis of Variance of Pupil Achievement" (unpublished Doctoral thesis, the University of Alberta, Edmonton, 1963).

with the other desired outputs of the educational system, then further implications may be possible. It could be, for instance, that the present emphasis on reduction of class size and the universal practice of remunerating teachers on the basis of training and experience are both unjustified. If further studies find continuation of the relationship between pupil achievement and the number of years the teacher has taught in his present school as found in this study, then more emphasis on school board policy affecting the retention of staff would be indicated.

Suggestions for further research. Further research would be valuable to attempt to determine the relationship between the selected variables and other desirable outputs of any educational system. The output used in this study, pupil achievement, is just one of many that should be investigated to clear the way for more useful implications,

Only one grade level was used in this study and further study could extend to other grade levels. Replications of the study at other grade levels should incorporate certain improvements in design. The design should permit the study of mobility, past non-promotion, and the sex of the pupil with the effects of other pupil variables removed. The two teacher variables, age and years of experience, should be investigated separately with

the effect of each one on the other removed. A more representative distribution of school sizes and a greater range of class sizes should be attempted in any replication of this study. The Peace River Area is rather specialized in terms of occupational opportunities and rather unique in the proportion of small one-room rural schools and hence further research in other parts of the province is indicated.

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APPENDIX

APPENDIX A

APPENDIX A

DATA

TABLE IX

DATA RELATING TO PUPILS--I

Variable	Number	Sum of Scores	Sum of Squares of Scores	Standard Deviation
Achievement	476	21,884	1,106,239	14.4984
Age	476	74,213	11,614,571	9.6159
Intelligence Quotient	476	2,188	11,794	1.9093
Socio-Economic Status	476	2,218	11,470	15.4350
Achievement--Male	258	11,756		
Female	218	10,128		
Achievement--Static	208	9,502		
Moved	268	12,382		
Achievement--Promoted	339	17,052		
Non-prom.	137	4,832		

TABLE X
DATA RELATING TO PUPILS--II

Variables	Sum of Products of Variables
Achievement: Intelligence Quotient	111,451
Achievement: Age	3,376,801
Achievement: Socio-Economic Status	99,555
Age: Intelligence Quotient	335,411
Age: Socio-Economic Status	347,499
Intelligence Quotient: Socio-Economic Status	9,888

DATA RELATING TO CLASSES, TEACHERS, AND SCHOOLS--I

Class	Number of Pupils	Mean Intelligence Quotient	Mean Socio-Economic Status	Mean Predicted Achievement
A	8	4.5	5.0	41.00
B	2	4.5	5.0	41.00
C	1	3.0	5.0	31.76
D	1	4.0	5.0	37.92
E	3	5.0	5.0	44.09
F	6	4.7	5.0	42.24
G	1	9.0	5.0	68.75
H	4	2.5	7.0	28.61
I	3	3.7	6.0	36.04
J	1	3.0	5.0	31.76
K	4	3.5	5.8	34.82
L	3	4.3	5.3	39.76
M	2	4.5	6.0	40.97
N	1	2.0	4.0	25.63
O	16	4.3	4.4	39.79
P	1	7.0	6.0	56.39
Q	32	7.1	4.1	57.06
R	30	4.9	4.4	43.49
S	21	4.6	4.8	41.63
T	23	3.5	4.4	34.86
U	27	4.3	5.3	39.76
V	4	3.3	5.8	34.58
W	28	6.1	3.7	50.92
X	27	4.7	4.8	42.25
Y	14	3.5	5.3	34.83
Z	5	3.4	5.0	34.22
AA	5	5.0	4.6	44.11
BB	1	3.0	7.0	31.70
CC	3	5.3	4.3	45.96
DD	1	7.0	4.0	56.46
EE	3	3.7	5.0	36.07
FF	35	4.4	4.5	40.41
GG	30	3.1	4.5	32.39
HH	20	6.2	4.5	51.50
II	2	2.5	5.0	28.67
JJ	2	2.5	5.0	28.67
KK	2	2.5	6.5	28.62
LL	4	3.5	5.0	34.84
MM	2	3.0	5.0	31.76
NN	1	3.0	5.0	31.76
OO	4	5.8	5.0	49.02
PP	3	3.7	5.0	36.07
QQ	2	2.5	5.0	28.67
RR	5	3.8	4.4	36.71
SS	12	4.7	4.2	42.27
TT	2	6.0	5.0	50.25
UU	28	4.5	4.1	41.03
VV	35	4.3	5.3	39.76
WW	6	3.8	4.2	36.72

DATA RELATING TO CLASSES, TEACHERS, AND SCHOOLS--II

Class	Mean Actual Achievement	Modified Achievement	Years of Teacher Education	Years of Teaching Experience
A	46.25	5.25	1	5
B	44.00	3.00	2	3
C	27.00	4.76	2	8
D	33.00	4.92	2	1
E	58.00	13.91	2	13
F	40.00	2.24	2	21
G	80.00	11.25	4	16
H	32.00	3.39	2	3
I	40.33	4.29	1	15
J	23.00	8.76	2	1
K	37.50	2.68	2	6
L	42.00	2.24	1	3
M	36.50	4.47	3	9
N	22.00	3.63	2	1
O	42.75	2.96	3	5
P	50.00	6.39	4	15
Q	68.44	11.38	2	21
R	48.63	5.14	3	2
S	45.86	4.23	2	7
T	31.96	2.90	2	3
U	40.30	.54	2	5
V	36.50	1.92	2	15
W	59.29	8.37	2	8
X	45.78	3.53	4	2
Y	38.43	3.60	2	4
Z	37.20	2.98	2	15
AA	43.20	.91	2	5
BB	29.00	2.70	2	19
CC	48.67	2.71	1	6
DD	63.00	6.54	1	4
EE	36.67	.60	2	5
FF	39.09	1.32	2	2
GG	36.27	3.88	4	2
HH	61.00	9.50	2	3
II	28.00	.67	2	3
JJ	33.00	4.33	2	1
KK	30.00	1.38	2	12
LL	36.75	1.91	3	12
MM	33.50	1.74	3	3
NN	31.00	.76	2	2
OO	49.00	.02	1	6
PP	37.00	.93	2	17
QQ	29.50	.83	1	1
RR	50.00	13.29	2	20
SS	51.17	8.90	3	12
TT	45.50	4.75	2	6
UU	50.39	9.36	5	3
VV	46.69	6.93	2	16
WW	43.50	6.78	2	8

DATA RELATING TO CLASSES, TEACHERS, AND SCHOOLS--III

Class	Age of Teacher	Sex of Teacher	Years in Present School	Size of School	Size of Class	Number of Grades
A	50	M	2	56		4
B	27	F	2	39		4
C	35	M	1	13		8
D	23	F	1	23		7
E	60	F	4	45		4
F	51	F	1	89		3
G	54	F	2	12		7
H	26	F	1	46		5
I	53	F	1	20		7
J	22	M	1	15		7
K	31	M	2	75		4
L	29	F	2	18		7
M	50	F	3	16		7
N	37	M	1	48		4
O	34	M	5	270	34	1
P	66	M	4	40		4
Q	53	M	10	528	39	1
R	26	M	1	528	37	1
S	53	M	2	528	38	1
T	24	F	1	528	32	1
U	33	F	2	401	39	1
V	54	F	1	26		7
W	34	F	5	376	39	1
X	25	F	1	376	37	1
Y	25	F	2	376	27	1
Z	43	M	5	97		4
AA	32	F	1	55		4
BB	58	F	1	41		4
CC	58	F	1	16		7
DD	36	F	1	20		7
EE	31	M	1	49		4
FF	23	M	1	612	40	1
GG	25	M	2	612	38	1
HH	24	F	2	612	22	1
II	24	F	3	23		8
JJ	22	F	1	13		7
KK	60	F	1	15		7
LL	44	F	2	14		7
MM	36	F	1	28		8
NN	23	M	1	11		7
OO	44	F	2	45		4
PP	40	M	2	62		4
QQ	35	M	1	31		5
RR	55	F	5	19		8
SS	34	F	7	97		2
TT	29	M	3	13		7
UU	39	M	1	300	32	1
VV	44	M	5	260	39	1
WW	27	M	2	82		4

APPENDIX B

APPENDIX B

QUESTIONNAIRE

NAME _____

Were you in Grade 7 last year, Yes ____ No ____ (If "No",
stop here)

.....
Name of School you were in last year:

Name of your homeroom teacher last year:

Name the school you attended for each grade: (Put in both
schools if you moved in the middle of a year)

Grade 1 _____

Grade 2 _____

Grade 3 _____

Grade 4 _____

Grade 5 _____

Grade 6 _____

Grade 7 _____

Have you ever failed a grade, Yes ____ No ____

If Yes, which grade or grades did you fail? _____

What is your father's occupation? (Give as accurate a
description as you can).

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